ANSWERS - AP Physics C Multiple Choice Practice – Work and Energy

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|  | Solution | Answer |
| 1. | The force needed to lift something at a constant speed is equal to the object weight F=mg. The power is then found by P = Fd / t = mgh / t | B |
| 2. | As the system moves, m2 loses energy over distance h and m1 gains energy over the same distance h but some of this energy is converted to KE so there is a net loss of U. Simply subtract the U2 – U1 to find this loss | A |
| 3. | In a force vs. displacement graph, the area under the line gives the work done by the force and the work done will be the change in the K so the largest area is the most K change | E |
| 4. | Since the speed is constant, the pushing force F must equal the friction force fk =µFn=µmg. The power is then given by the formula P = Fv = µmgv | C |
| 5. | velocity is the derivative of position therefore is proportional to t1/2 and sonce KE is propotional to v2, KE is proportional to t | C |
| 6. | Compare the U+K ( mgh + ½ mv2 ) at the top, to the K ( ½ mv2 ) at the bottom and subtract them to get the loss. | C |
| 7. | Use energy conservation, U top = K bottom. As in problem #6 (in this document), the initial height is given by L – Lcos θ, with cos 60 = .5 so the initial height is ½ L. | A |
| 8. | Use application of the net work energy theorem which says … Wnet = ∆K. The net work is the work done by the net force which gives you the answer | A |
| 9. | F = –dU/dx = –12x + 4 | B |
| 10. | First use the given location (h=10m) and the U there (50J) to find the mass.  U=mgh, 50=m(10)(10), so m = 0.5 kg. The total mechanical energy is given in the problem as U+K = 100 J. The max height is achieved when all of this energy is potential. So set 100J = mgh and solve for h | B |
| 11. | Simple P = Fv to solve | E |
| 12. | The force needed to lift something at a constant speed is equal to the object weight F=mg. The power is then found by P = Fd / t = mgh / t | E |
| 13. | U(x1) = –2 J and K(x1) = 1 J so E = K + U = – 1J. The horizontal line drawn at E = –1 J has turning points greater than x0 and less than x2 | E |
| 14. | The work done by a field is path independent and only depends upon the initial and final positions | A |
| 15. | To find work we use the parallel component of the force to the distance, this gives Fcos θ d | B |
| 16. | In a circle at constant speed, the work done is zero since the Force is always perpendicular to the distance moved as you move incrementally around the circle | A |
| 17. | K(r0) = 0 and U(r0) = 3U0 so E(r0) = K + U = 3U0 = U(2r0) + K(2r0) = U0 + ½ mv2 | C |
| 18. | F = –dU/dr | A |
| 19. | At the maximum displacement the K=0 so the 10J of potential energy at this spot is equal to the total amount of mechanical energy for the problem. Since energy is conserved in this situation, the situation listed must have U+K add up to 10J | B |
| 20. | Using the work-energy theorem. Wnc = ∆ ME,  WFt = ∆U+∆K,  – Fd = (mghf – mghi) + ( ½mvf 2 – ½mvi 2),  – (11000)(8) = (0 – (1000)(10)(8)) + (0 – ½ (1000)(vi2) … solve for vi | A |
| 21. |  | D |
| 22. | Wg(A→B) = –Wg(B→A) (independent of path) | C |
| 23. | First, the speed is constant, so you expect (by the Work-Energy Theorem) that there isn't any work. Beyond that, the definition of work for a constant force is F•Δr = FΔr cos θ. Since the force of the string is always radial, and the displacement tangential, the angle between these is 90º; the string can do no work. (It's basically the same story as with magnetic fields acting on free charges; no work can be done by the magnetic field because the force is at right angles to the displacement.) All the given numbers are merely distracters. | A |
| 24. |  | E |
| 25. | Power, in Watts, is work divided by time; power times time gives work. So the work performed by the motor is 1000W×10 s = 104 J. This is equal to the potential energy mgh gained by the safe = 100 kg × 10 m/s2 × h, so h = 104 J/1000 N = 10 m. | C |
| 26. | kg m/s is a unit of momentum | E |
| 27. | K is a scalar. Kf = ¼ Ki; ½ mvf2 = ¼ (½ mvi2) which gives vf = ½ vi but since it is traveling in the opposite direction vf (a vector) will be negative | D |
| 28. | Pavg = Fnetvavg = mavavg = (2000 kg)×(3 m/s2)×(10 m/s) | E |